IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A dual current-perpendicular-to-plane (CPP) GMR sensor, comprising:

a first magnetic shield formed of an electrically conductive and magnetically shielding material;

a second magnetic shield formed of an electrically conductive and magnetically shielding material, the first and the second magnetic shields disposed to define a read gap therebetween;

a spin valve structure disposed between the first and second magnetic shields, the spin valve structure including a dual spin valve arrangement, the dual spin valve arrangement having a top and bottom spin self-pinned layer and a free ferromagnetic layers disposed therebetween; and

a biasing layer disposed ~~proximate~~ adjacent only the top self-pinned layer in a passive region for pinning the top self-pinned layer.

2. (Currently Amended) The dual CPP GMR sensor of claim 1 further comprising:

a hard bias layer ~~disposed~~ separate and distinct from the biasing layer formed proximate the bottom self-pinned layer in a passive region for biasing the bottom self-pinned layer;

a first metal oxide layer disposed between the biasing layer and the hard bias layer for providing an insulation layer to the hard bias layer; and

a second metal oxide layer formed above the biasing layer.

3. (Canceled)

4. (Currently Amended) The dual CPP GMR sensor of claim [[3]] 2, wherein the metal oxide layers further comprises NiO.

5. (Currently Amended) The dual CPP GMR sensor of claim [[3]] 2 further comprises a ferromagnetic layer disposed over the second metal oxide layer and the self-pinned layer, wherein the second metal oxide layer removes exchange coupling to the hard bias layer.

6. (Original) The dual CPP GMR sensor of claim 5 further comprising a Ta layer formed between the ferromagnetic layer and the second shield.

7. (Original) The dual CPP GMR sensor of claim 6, wherein the ferromagnetic layer comprises NiFe.

8. (Original) The dual CPP GMR sensor of claim 1 further comprising a first and second metal oxide layer formed under and above the biasing layer.

9. (Original) The dual CPP GMR sensor of claim 8, wherein the metal oxide layers further comprises NiO.

10. (Original) The dual CPP GMR sensor of claim 9 further comprises a ferromagnetic layer disposed below the second shield and over the second metal oxide layer and the self-pinned layer, wherein the second metal oxide layer removes exchange coupling to the hard bias layer.

11. (Original) The dual CPP GMR sensor of claim 10 further comprising a Ta layer formed between the ferromagnetic layer and the second shield.

12. (Original) The dual CPP GMR sensor of claim 10, wherein the ferromagnetic layer comprises NiFe.

13. (Original) The dual CPP GMR sensor of claim 1, wherein the first and second shields function as electrodes for supplying current to the spin valve structure.

14. (Original) The dual CPP GMR sensor of claim 1, wherein the biasing layer comprises a layer of alpha-Fe_2O_3, the layer of alpha-Fe_2O_3 pinning the top self-pinned layer.

15. (Currently Amended) The dual CPP GMR sensor of claim [[1]] 14, wherein the layer of alpha-Fe_2O_3 pins the top portion of the top self-pinned layer by providing higher coercivity (H_C) to the top self-pinned layer.

16. (Currently Amended) A magnetic storage system, comprising:

a magnetic storage medium having a plurality of tracks for recording of data; and

a dual CPP GMR sensor maintained in a closely spaced position relative to the magnetic storage medium during relative motion between the magnetic transducer and the magnetic storage medium, the dual CPP GMR sensor further comprising:

a first magnetic shield formed of an electrically conductive and magnetically shielding material;

a second magnetic shield formed of an electrically conductive and magnetically shielding material, the first and the second magnetic shields disposed to define a read gap therebetween;

a spin valve structure disposed between the first and second magnetic shields, the spin valve structure including a dual spin valve arrangement, the dual spin valve arrangement having a top and bottom spin self-pinned layer and a free ferromagnetic layers disposed therebetween; and

a biasing layer disposed ~~proximate~~ adjacent only the top self-pinned layer in a passive region for pinning the top self-pinned layer.

17. (Currently Amended) The magnetic storage system of claim 16, wherein the CPP GMR sensor further comprises:

a hard bias layer ~~disposed~~ <u>separate and distinct from the biasing layer formed</u> proximate the bottom self-pinned layer in a passive region for biasing the bottom self-pinned layer;

a first metal oxide layer disposed between the biasing layer and the hard bias layer for providing an insulation layer to the hard bias layer; and

a second metal oxide layer formed above the biasing layer.

18. (Canceled)

19. (Currently Amended) The magnetic storage system of claim [[18]] <u>17</u>, wherein the metal oxide layers further comprises NiO.

20. (Currently Amended) The magnetic storage system of claim [[18]] <u>17</u>, wherein the CPP GMR sensor further comprises a ferromagnetic layer disposed over the second metal oxide layer and the self-pinned layer, wherein the second metal oxide layer removes exchange coupling to the hard bias layer.

21. (Original) The magnetic storage system of claim 20, wherein the CPP GMR sensor further comprises a Ta layer formed between the ferromagnetic layer and the second shield.

22. (Original) The magnetic storage system of claim 21, wherein the ferromagnetic layer comprises NiFe.

23. (Original) The magnetic storage system of claim 16, wherein the CPP GMR sensor further comprises a first and second metal oxide layer formed under and above the biasing layer.

24. (Original) The magnetic storage system of claim 23, wherein the metal oxide layers further comprises NiO.

25. (Original) The magnetic storage system of claim 24, wherein the CPP GMR sensor further comprises further comprises a ferromagnetic layer disposed below the second shield and over the second metal oxide layer and the self-pinned layer, wherein the second metal oxide layer removes exchange coupling to the hard bias layer.

26. (Original) The magnetic storage system of claim 25, wherein the CPP GMR sensor further comprises a Ta layer formed between the ferromagnetic layer and the second shield.

27. (Original) The magnetic storage system of claim 25, wherein the ferromagnetic layer comprises NiFe.

28. (Original) The magnetic storage system of claim 16, wherein the first and second shields function as electrodes for supplying current to the spin valve structure.

29. (Original) The magnetic storage system of claim 16, wherein the biasing layer comprises a layer of alpha-Fe_2O_3, the layer of alpha-Fe_2O_3 pinning the top self-pinned layer.

30. (Currently Amended) The magnetic storage system of claim [[16]] 29, wherein the layer of alpha-Fe_2O_3 pins the top portion of the top self-pinned layer by providing higher coercivity (H_C) to the top self-pinned layer.

31. (Currently Amended) A method for providing a dual current-perpendicular-to-plane (CPP) GMR sensor with improved top pinning, comprising:

forming a first magnetic shield of an electrically conductive and magnetically shielding material;

forming a second magnetic shield of an electrically conductive and magnetically shielding material, the first and the second magnetic shields disposed to define a read gap therebetween;

forming a spin valve structure between the first and second magnetic shields, the spin valve structure including a dual spin valve arrangement, the dual spin valve arrangement having a top and bottom spin self-pinned layer and a free ferromagnetic layers disposed therebetween; and

forming a biasing layer disposed ~~proximate~~ adjactent only the top self-pinned layer in a passive region for pinning the top self-pinned layer.

32. (Currently Amended) The method of claim 31 further comprising:

forming a hard bias layer separate and distinct from the biasing layer formed proximate the bottom self-pinned layer in a passive region for biasing the bottom self-pinned layer;

forming a first metal oxide layer between the biasing layer and the hard bias layer for providing an insulation layer to the hard bias layer; and

forming a second metal oxide layer above the biasing layer.

33. (Canceled)

34. (Currently Amended) The method of claim [[3]] 32 further comprises forming a ferromagnetic layer over the second metal oxide layer and the self-pinned layer, wherein the second metal oxide layer removes exchange coupling to the hard bias layer.

35. (Currently Amended) The method of claim [[5]] 34 further comprising forming a Ta layer between the ferromagnetic layer and the second shield.